An Audit of the
Office of the Sheriff
Electronic Medical Records System

February 2008

Committee on Finance and Audit

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February 12, 2008

To the Honorable Chairman
  of the Board of Supervisors
    of the County of Milwaukee

We have completed an audit of the development, implementation and direct and indirect costs of the Electronic Medical Records (EMR) system implemented by the Office of the Sheriff for inmate medical services at the Criminal Justice Facility and the House of Correction. To assist us we contracted with an outside consultant to perform a high-level functional and technical assessment of EMR and to identify problems with its implementation. The consultant's report is included as **Attachment A.**

The audit report contains a recommendation to replace the existing EMR system rather than continuing attempts to give the system desired functionality. It also recommends using the lessons learned from this and other problematic information technology (IT) implementations to create Countywide policies and procedures for future IT purchases, to help improve the potential for successful IT implementations.

Responses from the Office of the Sheriff and the Information Management Services Division are included as **Exhibits 2** and **3**, respectively. We appreciate the cooperation extended by the Office of the Sheriff and its staff during the audit, as well as the staff at IMSD.

Please refer this report to the Committee on Finance and Audit and to the Committee on Judiciary, Safety and General Services.

Jerome J. Heer
Director of Audits

JJH/cah

Attachment

cc: Milwaukee County Board of Supervisors
       Scott Walker, Milwaukee County Executive
       David A. Clarke, Jr., Milwaukee County Sheriff
       Dennis John, Director, Information Management Services Division
       Cynthia Archer, DAS Acting Director, Department of Administrative Services
       Terrance Cooley, Chief of Staff, County Board Staff
       Stephen Cady, Fiscal and Budget Analyst, County Board Staff
       Delores Hervey, Chief Committee Clerk, County Board Staff

An Audit of the Office of the Sheriff Electronic Medical Records System

Table of Contents

Summary

County Board Resolution 07-179 authorized and directed the Department of Audit to conduct an audit of the development, implementation and direct and indirect costs of the electronic medical record (EMR) system being implemented for inmate medical services at the Criminal Justice facility and the House of Correction. To assist us in meeting this directive, we entered into a professional services contract with an outside vendor to perform a high-level functional and technical assessment of EMR to identify problems with its implementation. Their report is attached in its entirety as **Appendix A**.

Neither report questions the decision by the Office of the Sheriff to migrate from paper records to an EMR system. The benefits of EMR systems are well documented, and the movement in that direction is in keeping with current trends. However, the reports identify concerns with the manner in which the current system was selected and implemented. Further, while noting positive impacts from the conversion to an EMR system, the reports indicate the EMR project has failed to fully achieve desired financial and system effectiveness goals.

Fiscal Impact

The decision in 2003 to acquire and implement an EMR system has resulted in reduced annual operating expenses that will continue to offset initial project acquisition and implementation costs into the future. However, the annual savings are at least $200,000 less than anticipated.

As detailed in **Section 2** of this report, we estimate that the direct and indirect cost associated with the acquisition, implementation and ongoing operation of the EMR system through year-end 2007 total $1.3 million. These costs include payments to vendors as well as the cost of staff time and equipment associated with Information Management Services Division (IMSD) technical assistance. Reduced manual records management costs of $1.1 million partially offset that amount, resulting in a net cost of approximately $177,000 related to the EMR system implementation during the period 2004—2007.

However, based on fiscal impact information provided to the County Board in a September 2003 appropriation transfer request from the Sheriff's Office, savings anticipated from the project should have exceeded total project costs by about $933,000 during that time period. Thus, four years after requested funding for the EMR project was authorized, the actual fiscal impact of the decision to

implement an EMR system at the CJF and HOC has fallen short of projected savings by $1.1 million.

System Impact

The EMR system has allowed the Office of the Sheriff to make significant progress toward achieving critical goals of standardizing clinical documentation, tracking inmate health services, and conducting quality reporting. However, gaps in the software's performance and functionality have led to numerous concerns by clinical users and IMSD support staff. The following table highlights the findings and presents a rating of the risk each focus area presents to the County moving forward.

Focus Area	*Assessment*	*Primary Reason*	*Forward Risk*
Vendor Selection Process	Fair	• Criteria qualitative, cost primary driver • No user involvement in requirements	Medium
Implementation Process	Fair	• Gaps in requirements, design, testing, training	Medium
Vendor Fit	Poor	• Not an EMR specialist • Technical support variable	High
Current Processes	Fair	• Some improvements over implementation • Lack of standardization	Medium
Functional Fit	Fair	• System flexible • Many features not implemented • Missing integrity and safety checks	High
Technical Performance	Fair	• Performance unacceptable at HOC • Large amount of unsupported custom code	High
Business Fit	Fair	• Some goals achieved • Lack of comprehensive business requirements	Medium

We concur with the consultant report's recommendation to limit investment of County resources to that which is necessary to maintain the current functionality or address immediate patient safety concerns, while pursuing a strategy to replace the EMR system. We estimate that the annual cost of simply maintaining the system is about $446,000, and that the cost to purchase and install a new system would be about $1.1 million. This is a ballpark estimate which needs to be fine-tuned based on a closer evaluation of the Sheriff's Office's needs.

The report also contains a recommendation that the lessons learned from this software purchase and installation be used to create policies and procedures for all County departments to follow, to help provide a greater chance for success in future IT purchases and implementations. We would

like to acknowledge the cooperation of the Office of the Sheriff and IMSD throughout the audit process. A management response by each department is included as **Exhibits 2** and **3**, respectively.

Background

In December 2003, the County Board authorized the Office of the Sheriff to enter into a contract with Sequest Technologies for $494,542 for the development, acquisition and implementation of an electronic medical records (EMR) system for use in the Criminal Justice Facility and the House of Correction (File No. 03-623). Implementing the EMR system was intended to improve medical services management and help ensure compliance with the Christiansen consent decree. The Christiansen consent decree is a court sanctioned agreement that Milwaukee County entered into as a result of a lawsuit alleging, among other things, that previous County jail conditions deprived inmates access to adequate medical and mental health care.

It was expected that the Totally Integrated Electronic Record (TIER) system (the EMR package purchased) would provide for better care and treatment notifications, scheduling and documentation improvements, and significant savings through better staff time management. After a one-year developmental period, medical services personnel began using the TIER system in December 2004. Numerous problems have been reported since TIER went live. The nurses union reported a lack of policies and procedures, several system access issues, and the inability to retrieve basic patient data.

At the request of the Office of the Sheriff, IMSD assigned several full-time personnel to assist the vendor in resolving the problems. Though IMSD staff has had some success in trying to make functional a number of the EMR system features, much work remains, raising the question of whether or not the EMR will ever function as originally intended.

Section 1: EMR Purchase, Development and Implementation

One of the components of the County Board's directive for this report was to audit the development and implementation of the electronic medical records (EMR) system.   To assist us we contracted with SysLogic, a consultant with extensive experience in evaluating the processes used for developing and implementing information technology (IT) systems.   The consultant's findings and recommendations are attached to this report as **Appendix A**.

In addition to the work of SysLogic, we reviewed available documentation and conducted extensive interviews to help piece together the process used to solicit potential EMR vendors, make the final selection, and subsequently develop and implement the EMR system. This included managers and staff at several levels at the Office of the Sheriff, HOC, IMSD, medical staff, the former program administrator at the time of the purchase, and representatives from the two EMR vendors that submitted proposals.   We also interviewed members of the review panel we could locate that were responsible for evaluating (1) oral presentations made by six potential vendors, and (2) proposals submitted by two vendors in response to the Sheriff's Office's request for proposal (RFP). Due to the limited amount of records that could be located documenting the selection process, we relied heavily on interview information for this portion of the audit.

Our report, along with the attached consultant's report, identifies significant deviations from best practices in all aspects of the project.

Our report, along with the attached consultant's report, identifies significant deviations from best practices in all aspects of the project, including the evaluation, purchase, development and implementation of the EMR system.   The negative impact on operations is readily gleaned from the attached report.   It concludes that the Sheriff's Office purchased a product that was not designed for a correctional facility, and as a consequence,

has required and continues to require substantial customized computer programming modification to meet the medical unit's needs. Over three years have passed since the system went live in December 2004, yet IMSD is continuing to modify the EMR system to give it the functionality initially envisioned.

The delay in achieving full functionality has negatively impacted anticipated fiscal benefits of installing the EMR system.

The delay in achieving full functionality has also negatively impacted the anticipated fiscal benefits of installing the EMR system. Although conversion to an electronic medical records system has resulted in annual operating savings that have essentially paid for the overall project cost, projected savings have not been fully realized. **Section 2** of this report presents details of the fiscal impact of the decision to implement the EMR system during the four-year period 2004–2007, comparing actual acquisition, implementation and operating costs/savings with projections based on initial project estimates.

The outlook for the current EMR system is not good. The consultant recommends a better course of action would be to purchase a new system rather than to incur additional costs attempting to service a system that does not adequately reduce the County's exposure to potential, avoidable risks. We concur with that assessment. The end of **Section 2** discusses the costs associated with maintaining the current EMR system, including a ballpark estimate for purchasing a new system.

The remainder of this section will discuss the deviations from best practices in the purchase, development and implementation of the EMR system that collectively has not lived up to expectations, and continues to incur modification costs with no end in the foreseeable future.

Several points give rise to the question of whether or not the selection was in fact independent.

Vendor Solicitation and Selection

Several points give rise to the question of whether or not the selection was in fact independent, and was based on the merits

of the systems reviewed and their ability to meet the technical requirements of the Sheriff's Office.

Point No. 1 - The program administrator tightly controlled the vendor solicitation and selection processes, with little documentation supporting:

- The method by which vendors were identified to solicit interest.

- How responses were pared down to the six vendors asked to give oral presentations.

- The final tally of evaluations prepared by 10-15 panel members that resulted in the further paring down to the three vendors from whom proposals were solicited.

- The final tally of results of the RFP evaluation.

Tightly controlling the evaluation process by itself is generally not problematic. However, leaving no documentation of the evaluation process does raise concerns.

Point No. 2 – In creating the technical specifications of the system, no input was requested of IMSD. Nor was IMSD represented on the panel reviewing the oral presentations and the two responses to the RFP. This exposes the process to speculation that the specifications may have been written so broadly that a potential shortcoming in a vendor's technical expertise would not necessarily disqualify it from consideration. IMSD staff was involved only to provide infrastructure support and to create the interface to the Criminal Justice Information System (CJIS). IMSD staff indicated in interviews that they did not know why IMSD was not involved to a greater extent.

Point No. 3 – The RFP weighed the cost factor at 40% of the total evaluation points. Persons involved in the evaluation believed that cost considerations overruled all other factors when the final decision was announced. Together with no documentation of the evaluation forms or anything that summarizes the results, this factor could have been over-inflated in announcing the results so that choosing the vendor with no correctional-based experience appeared justified.

Point No. 4 – The Program Administrator had previously purchased a system from, and therefore had a previous working relationship with the lowest bidder prior to County employment. More importantly, when the program administrator left County employment in early 2005, he shortly thereafter went to work for the same vendor that was selected.

Taken separately, each of the first three points would not necessarily raise concerns of an independence issue. However, in conjunction with the fourth point, it can be argued that the appearance of a conflict of interest exists.

On the other hand, we learned from the other vendor submitting a bid that the Program Administrator had worked on and off for that firm four times prior to working for the County. Also, the Program Administrator told us the technical specifications used in the RFP came from the losing bidder's web site.

The Program Administrator should have recused himself from the selection process.

This information raises further concerns regarding potential conflicts of interest in the selection of an EMR system vendor for this project. The apparent connection to both firms should have been reported by the Program Administrator, and he should have recused himself from the selection process.

EMR Development and Implementation

Resources currently exist that can assist buyers of EMR systems in developing and implementing EMR systems.

Resources currently exist that can assist buyers of EMR systems to help their organizations achieve success in developing and implementing EMR systems. When compared to the process used to develop and implement the current EMR system, it can easily be seen how the path followed by the Office of the Sheriff deviated from the prescribed path. Many of the problems noted in the attached consultant's report are a result of not abiding by some of these basic purchase, development and implementation guidelines.

One set of helpful guidelines were noted in an article "Planning Your Electronic Health Record System: Guidelines for Executive Management." It was prepared by a joint Task Force of representatives of the software companies that have created EMR systems for the behavioral health and human services community (Software and Technology Vendors' Association) and an alliance of behavioral health organizations that use EMR products (Mental Health Corporations of America). While written

for a behavioral health audience, it can easily be adapted for purchase and implementation of an EMR for other environments such as corrections, or even other types of IT projects.

One of the basic tenets is for management to strive to select cross-functional teams to plan and implement EMR projects. Cross-functional teams blend supervisory and line staff from all critical functions affected by EMR. This not only helps ensure staff buy-in to the proposed changes that will take place, but also provides an opportunity to improve overall operations by allowing all voices to be heard.

Ideas for improvement could have been integrated into the new EMR project.

For this particular project, a cross-functional team would have provided a forum for input on the manner in which the Office of the Sheriff and HOC handles its day-to-day inmate care operations. Ideas for improvement could have been integrated into the new EMR project.

With the Program Administrator assuming control of the process without the benefit of a cross-functional team, it was not surprising that implementation delays developed. Staff noted that they did not know who to turn to for problem resolution when the program administrator was not available. This approach contributed to other, perhaps more significant problems than simple time delays. Some of the other guidelines that were not followed are noted below.

Awareness During Software Selection - Before buying a product, it is important to decide up front the amount of customizing that will be required. Are you looking to customize a product to mirror your best practices (integrating your existing forms, workflows, treatment protocols, etc.)? Or do you want a product from a vendor that has developed a product based on many experiences with best practices, where the purchaser modifies its environment to that envisioned by the product. The first involves significantly modifying existing program code, the second involves few changes.

Based on the amount of custom code the system currently uses, it appears that the Office of the Sheriff was looking for a product

customized to mirror its operations. This is generally more expensive because of the amount of customization. However, since IMSD (rather than the vendor) did much of the customization, it does not appear that there was a proper 'meeting of the minds' as to what each party's expectations were in this area.

Review Other Systems In Use – Much can be learned by speaking with other purchasers of products being considered. What to look for, and perhaps more importantly, what to avoid, can save time and effort down the road. It is unknown how many other EMR products that the Program Administrator or other potential system users had seen in use, or had talked to other purchasers. However, neither the Program Administrator nor anyone on the review panel could have seen the purchased EMR product in use in a correctional environment or a primarily medical environment before, since Milwaukee County was the vendor's first venture in this environment.

Criteria for Evaluating Products – Guidelines discuss several aspects of product acquisition, such as preparing requests for information, and requests for proposals. This includes developing criteria for deciding which product (or vendor) to select. Ten factors were noted, such as price, ease of implementation, ease of use, software functionality, vendor support, etc. Not surprising, first-time EMR buyers ranked 'cost' as the most important criterion. Interestingly, companies making subsequent EMR purchases ranked product cost as the least important criterion.

Cost should be evaluated in context with all other factors.

The Sheriff's Office's RFP included six criteria and their associated weight that was to be used for ranking vendors. Cost was rated most important, weighted about three to four times higher that any other single factor. While cost certainly is an important factor, it should be evaluated in context with all other factors. However, in this case it appears that cost was the only criterion of consequence used for making the selection, based on comments by review panel members.

Organizational Involvement – One of the most important of all EMR purchasing guidelines might be the need to involve all parties that have a stake in the product that will ultimately be in use throughout the development and implementation, including executive management. It also involves concurrence at project completion by those same parties that the final product meets everyone's needs.

Guidelines emphasize the need for clinical staff to be well represented on the project team. Interviews with the Medical Director, nursing staff, and others critical to the development of the EMR indicated they were not substantially involved in the initial project planning. Their input in the developmental process was limited to confirming that forms developed within TIER

matched the paper forms in use. Requesting their input when developing the technical criteria for the RFP would have been an appropriate time to involve these system users to ensure everyone's needs are addressed.

Input from other staff using the system is also important. Staff should be allowed to view the system in the early design stages and provide feedback. Seeking review and comment on screen design, pre-defined content, drop-down list development and training needs will provide valuable insights into what staff want to see in the system. Incorporating staff feedback will increase the general staff ownership in the end product. Little of this was done in the implementation of the EMR.

Organizational Communication – Guidelines recommend project management articulate the vision of the EMR throughout the organization, to communicate clearly and frequently the reasons for implementing the system to reduce staff resentment and resistance to change. Interviews with nurses indicated they were not even aware of an EMR system being implemented until they were scheduled for training late in 2004.

Training – Creation of a formal training program is a must when implementing an EMR system. Knowing the ins and outs of using computer hardware and software will improve staff productivity, and will help minimize the inevitable initial drop in productivity. The consultant's report concluded that training was inadequate and performed on an incomplete system.

Had these guidelines been followed, the Office of the Sheriff might have been able to avoid many of the pitfalls encountered in its attempt to purchase and implement an EMR system.

Need for Greater IMSD Involvement

Lessons learned from major information technology projects, both past and present, can be used to create a blueprint for use by the County moving forward.

Research into best practices can help provide a better structured approach during those times when the County again is required to design and implement a computer information systems such as EMR. The lessons learned from EMR and other major information technology projects, both past and present, can be used to create a blueprint for use by the County moving forward.

IMSD staff was involved only to provide infrastructure support and to create the interface to the Criminal Justice Information System (CJIS). Though managers from IMSD's infrastructure and applications areas participated in early planning sessions

with the EMR vendor, IMSD staff interviewed did not know why IMSD was not involved to a greater extent. An IT analyst who had participated in reviewing vendor proposals had been reassigned to another department early in 2004 as part of the consolidation of IT functions to IMSD. As a result, the analyst was not available to work on the implementation project.

It is clear in this instance that having IMSD in a more authoritative up-front role in all phases (planning, purchase, development and implementation) could have significantly contributed to a successful EMR system. From a planning standpoint, a stronger up-front collaboration of IMSD and system users at all levels could have helped match up the business needs of the users with available standard product features. Up front technical assistance by IMSD could have helped identify the potential pitfalls of shoe-horning a system into a process that itself may not reflect best practices. It may have revealed the need to improve the existing process to better match up with possible EMR systems.

From a purchasing standpoint, IMSD involvement would have increased the likelihood of buying a product more in concert with the Sheriff's Office's needs, and perhaps just as important, identify systems being sold that lack standard features. For example, greater up-front involvement might have been able to identify that the current EMR system did not have a built-in control to automatically provide warnings of contraindications or other potentially harmful interactions or side effects relating to administering medications. This feature, standard in current EMR systems, helps achieve the goal of improved patient care.

From a development standpoint, early IMSD involvement would have put the Sheriff's Office in a better position to know what was required to make select functionalities work within a reasonable implementation timeframe, and likely reduce the computer-related problems that later surfaced as the TIER

product was implemented. IMSD's experience might have revealed the need to address, for example, a connectivity with HOC prior to implementation, before that issue became a major problem.

The value of up-front collaboration with IMSD in County-wide information technology purchases such as this can be substantial, as evidenced by the cost of the current system and loss of projected savings.

IT Steering Committee

The County currently has in place the mechanism for ensuring IMSD involvement in future IT purchases.

The County currently has in place the mechanism for ensuring IMSD involvement in future IT purchases. The 2001 Adopted Budget directed IMSD to establish an Information Technology Council. In 2003, an advisory workgroup consisting of IMSD's Chief Information Officer, the Director of Audits, and County Board research staff, recommended an Information Technology Steering Committee be created to replace the existing IT Council. It also recommended that managers should assess the potential for improving internal business processes whenever they implement IT projects. Also, in 2003 the IT Steering Committee was restructured to consist primarily of departmental business managers to address high-level County-wide information technology priorities.

The IT Steering Committee is in the process of strengthening its charter to address overall County IT issues. We believe a well-run IT Steering Committee puts the County in a more favorable position to maximize the chance for success in future IT ventures.

Departmental management must maintain final responsibility for IT decisions that directly impact their operations.

A 'go' or 'no-go' decision needs to be made with a better understanding of what it will take to implement a new computer system, or alter an existing one. IMSD has the experience and expertise to provide that assistance. However, departmental management needs to maintain responsibility for deciding what

functions they administer can benefit from information technology improvements. Similarly, for IT purchases and implementations, they must maintain final responsibility for IT decisions that directly impact their operations. This includes an active decision-making role throughout the planning, purchase and implementation processes so they have a clear understanding of issues that frequently arise and the impact of decisions that need to be made.

If it is decided to replace the existing EMR system with one that better meets the needs of the Sheriff's Office and HOC, we recommend that the Sheriff's Office:

1. *Work with IMSD to (1) identify the specific goals, objectives and desired functionality for a replacement electronic medical records system, (2) properly research EMR systems that meet stated goals, objectives and functionality, and document the selection process, and (3) prepare a detailed implementation plan that includes input from all pertinent system users.*

The extent of IMSD involvement would be predicated on the nature of the system being considered. IMSD could be helpful in assessing the technical capabilities of the system in light of current or needed IT infrastructure; developing reasonable cost estimates for purchase price and ongoing maintenance contracts; establishing a minimum set of standard criteria for evaluating vendor proposals to provide for a more objective decision structure; identifying the extent to which a purchased product would need to be modified; and designating an experienced Project Leader and forming a Project Team that incorporates a wide range of user perspectives, if necessary.

It is important to establish a formal structure that requires upfront IMSD involvement to help improve the chances for successful IT implementations in the future. Therefore, we recommend that the IT Steering Committee:

2. *Develop formal guidelines for County Board consideration, for use by all County departments when considering investments in new computer information technology systems, and for enhancing existing IT systems. The guidelines, in the form of a policies and procedures manual, should include as a minimum a requirement to obtain IMSD technical assistance to better estimate the overall cost to purchase and implement the system before any funding request. The extent of IMSD technical assistance should be predicated by the size and complexity of the function.*

Section 2: Fiscal Impact of the EMR System

In September 2003, the County Board authorized $680,000 for the purchase and implementation of an electronic medical records system for the Criminal Justice Facility (CJF) and the House of Correction (HOC). In its funding request, the Office of the Sheriff stated that records would be created, stored and retrieved electronically, eliminating the need for permanent staff dedicated to maintaining the system, reduce error and provide records quickly to anyone with authorized access. The report noted that EMR would reduce space dedicated to the storage of records and significantly reduce operating costs. The report went on to say that "EMR would improve virtually all aspects of the medical records system."

Through 2007, direct and indirect costs associated with the EMR system total $1.3 million.

Our audit, along with the appended consultant report, has noted problems associated with the purchase and implementation of the EMR system. These problems have contributed to the County achieving smaller operating cost reductions than initially projected. Through the end of 2007, we estimate that direct and indirect costs associated with the acquisition, implementation and ongoing operation of the EMR system total $1.3 million. These costs include payments to vendors as well as the cost of staff time and equipment associated with IMSD technical assistance. **Table 1** presents a breakout of our EMR project cost analysis.

Table 1
Total Cost of EMR Project
2004—2007

Acquisition & Initial Implementation:	Actual Cost	Initial Project Cost Estimate	Difference
Vendor Payments:			
Initial Contract Amount	$494,542		
Two Change Orders	$38,081		
Additional charges	$46,265		
Other hardware & software costs	$91,948		
Subtotal	$670,836	$650,000	$20,836
IMSD Staff Time Costs: [1]			
For 2004	$129,949	$30,000	$99,949
Total Acquisition & Implementation	**$800,785**	**$680,000**	**$120,785**
Ongoing Operations & Continued Implementation [2]			
Vendor Payments (2005 – 07):			
Maintenance & subscription fees	$80,700	$78,813	$1,887
Hardware replacement	$0	$78,813	($78,813)
Medical records consultant	$0	$204,913	($204,913)
Subtotal	$80,700	$362,539	($281,839)
IMSD Staff Time Costs: [1] 2005	$237,814	$50,700	$187,114
2006	$91,862	$53,235	$38,627
2007	$73,337	$55,897	$17,440
Subtotal	$403,013	$159,832	$243,181
Other IMSD Costs: Hardware	$24,257		
IMSD Consultant	$4,410		
Subtotal	$28,667	$0	$28,667
Total Ongoing Operations & Implementation	**$512,380**	**$522,371**	**($9,991)**
Total Project Cost	**$1,313,165**	**$1,202,371**	**$110,794**

Note [1] : Represents actual costs based on labor hour estimates, including fringe benefits. The fringe benefit rates provided by DAS, representing a weighted average for each year, were 58.10% for 2004, 66.41% for 2005, 64.32% for 2006, and 73.34% for 2007.

Note [2] : We applied annual increases of 5% to the initial project cost estimates for comparability purposes.

Source : Actual costs from Accounts Payable invoices, DAS fringe benefit rates and IMSD records. Initial project cost estimates from Sheriff's Office appropriation transfer request dated September 13, 2003, adjusted by Dept. of Audit as noted above.

Cost of Acquisition and Initial Implementation

As shown in **Table 1**, the initial cost estimate for acquiring and implementing an EMR system was $680,000. This estimate included vendor payments for hardware, software development

and installation, and included $30,000 for technical assistance from IMSD staff.

While actual vendor payments exceeded initial estimates by just $20,000, the cost of IMSD staff assistance exceeded expectations by $100,000, resulting in total cost overruns of $120,000 (17.6%) for project acquisition and initial implementation.

According to Sheriff's Office fiscal projections, the EMR system was to be fully implemented and functional by year-end 2004.

According to Sheriff's Office fiscal projections, the EMR system was to be fully implemented and functional by year-end 2004, with net annual operating savings of approximately $480,000 beginning in 2005. However, as detailed in the SysLogic report (**Appendix A**) and reflected in the 2005 IMSD staffing costs of $237,800, as shown in **Table 1**, implementation of the EMR system was far from complete after the first year of the project.

Cost of Ongoing Operations and Continued Implementation
As reflected in the data in **Table 1**, the Sheriff's Office was able to mitigate unplanned expenditures for IMSD support, primarily by eliminating the planned expenditure of approximately $200,000 for a medical records consultant. As a result, costs for ongoing operations and continued implementation efforts of $512,000 during the years 2005–2007 were slightly less than the $522,000 indicated by initial projections.

Thus, four years after initiation of the project, total direct and indirect costs ($1.3 million) have remained reasonably close to those that could have been anticipated from initial cost estimates projected over that time period ($1.2 million).

However, a third key component of successfully achieving initial project goals, significant cost reductions through the elimination of manual records management expenditures, was not fully realized.

Savings from Reduced Manual Records Management Costs

The costs noted in **Table 1** do not represent the total fiscal effect of implementing the EMR system. In its request for project funding, as well as in subsequent budget narratives, the Office of the Sheriff stated that a contract worth $650,000 for an outside vendor to maintain manual medical records would be eliminated. These projected savings, directly attributed to the EMR system by the Office of the Sheriff, were not fully realized because implementation problems required manual medical records to be maintained. Thus, as shown in **Table 2**, total savings of $2.1 million should have accrued during the past four years, based on initial project cost information provided to the County Board, to offset project acquisition and implementation costs. However, actual savings during that time totaled $1.1 million.

Table 2
Actual vs. Projected Annual Savings
On Manual Medical Records Maintenance Costs
From EMR System Implementation
2004—2007

Year	Actual Savings [1]	Initial Projected Savings	Difference
2004	($13,155)	($185,000)	$171,845
2005	($410,690)	($650,000)	$239,310
2006	($397,427)	($650,000)	$252,573
2007	($315,000) [2]	($650,000)	$335,000
Totals	($1,136,272)	($2,135,000)	$998,728

Note [1]: Actual savings are computed using projected savings less actual costs. For 2004 (a partial year), savings of $185,000 were projected. Actual savings for 2004 were based costs of $636,845 compared to a projected full year of manual medical record costs of $650,000.

Note [2]: We used the budgeted expense amount of $335,000 (initial budget of $75,000 plus an approved budget request for $260,000 in November 2007) rather than actual for 2007 since the year's activity was incomplete.

Source :   Actual costs from Accounts Payable invoices, Initial project cost estimates from Sheriff's Office appropriation transfer request dated September 13, 2003.

Cost savings were short of projections due to the inability of CJF and HOC medical staff to rely solely on the TIER system for their medical records needs.

Although manual records management cost savings of approximately $1.1 million were achieved, they were short of projections due to the inability of CJF and HOC medical staff to rely solely on the TIER system for their medical records needs.

According to Sheriff's Office fiscal staff and budget narratives contained in the 2005 and 2006 Adopted Budgets, other operational savings not identified in the initial project cost information are attributable to implementation of the EMR system. These include a reduction of approximately $200,000--$300,000 annually in contractual temporary nursing services, as well as a reduction of $120,160 annually for the elimination of four unit clerk positions. However, the fiscal staff acknowledges it is difficult to directly link implementation of the EMR system with reduced temporary nursing service expenditure, particularly in light of simultaneous increases in full time nursing staff during this period. Further, we noted that three of the four unit clerk positions eliminated in the 2005 Adopted Budget were vacant positions, resulting in no actual savings. It is unclear whether the reduction of one unit clerk was directly attributable to implementation of the EMR system. The Director of Nursing at the CJF could not verify that linkage.

Net Fiscal Impact

Through 2007, the total direct and indirect cost of implementing the EMR system has totaled about $1,313,000. By combining the results of **Table 1** and **Table 2** we can calculate the fiscal impact of implementing the EMR system by comparing actual project costs and savings offsets with projections based on initial project estimates. A summary of this comparison is presented in **Table 3**.

Table 3
Fiscal Impact of EMR System Implementation
2004—2007

Net Cost of EMR System:
   Total Cost $1,313,165
   Less Actual Savings $1,136,272
      Net Cost of EMR System   **$176,893**

Less Expected Fiscal Position by Year End 2007:
   Total Projected EMR System Costs $1,202,371
   Less Total Projected Savings $2,135,000
   **Expected Fiscal Position**   **($932,629)**

Difference – Net Fiscal Impact   **$1,109,522**

Source :   Summary of data presented in Table 1 and Table 2 of this report.

As of year-end 2007, the EMR system has resulted in net costs of approximately $177,000. In contrast, based on initial project cost information, the EMR system was projected to realize net savings of about $933,000 by that time, for a difference of $1.1 million. Just as importantly, as detailed in the SysLogic report attached as **Appendix A** to this report, the project has failed to achieve the desired goal of implementing a fully functional, efficient electronic medical records system for the CJF and HOC.

Figure 1 illustrates the fiscal picture that emerges during the four-year period 2004–2007 by comparing actual net project costs/savings to those indicated from initial projections provided by the Sheriff's Office.

Figure 1
Net EMR Projections Costs/(Savings)
Years 2004 Through 2007
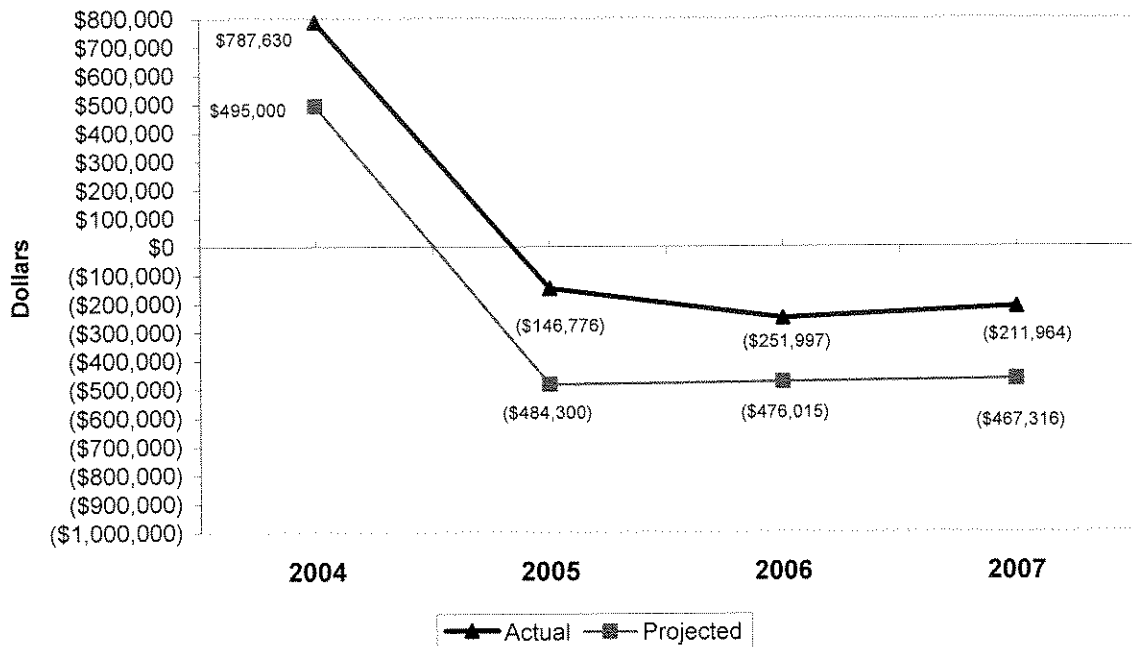
Actual Net Project Cost/(Savings) Total = $176,893
Projected Net Project Cost/(Savings) Total = ($932,631)

Source: Source data as noted in Table 1.

As shown in **Figure 1**, the decision in 2003 to acquire and implement an EMR system has resulted in reduced annual operating expenses that will continue to offset initial project acquisition and implementation costs into the future. However, the annual savings are at least $200,000 less than anticipated.

Moving Forward

Section 1 of this report, along with the appended SysLogic report, discussed the many problems associated with the purchase and implementation of the EMR system. The consultant's report suggests that the County should limit further investment in the current EMR system, and we concur. As noted in the report, continued reliance on the heavily customized TIER system exposes the County to avoidable risks that can be addressed through proper planning, selection and implementation of a superior EMR product.

It should be noted that the president of the current EMR vendor informed us his company is committed to supporting its EMR product with the County. However, it is unknown to what extent the cost of fixing known problems will be covered by the vendor in its annual maintenance agreement with the County. Further, it is highly likely that the current amount of IMSD support will continue and perhaps increase if new, desirable functionality is added to the EMR system.

Estimated Cost of New EMR System

Despite the many problems and disappointing results associated with the EMR system implementation, the decision to migrate from manual medical records to an electronic system is sound and in keeping with current trends. We contacted four vendors to get a ballpark estimate of the cost of a new EMR product and its associated annual costs. Our focus was on identifying vendors with experience with correctional facilities. We also looked for vendors whose product has been certified by the Certification Commission for Healthcare Information Technology (CCHIT). CCHIT is a recognized nonprofit certification body for electronic health records and their networks. It certifies systems that meet a comprehensive set of criteria for functionality, its ability to interact with standard-based healthcare information systems, and data security. Three of the four vendors contacted offered products certified by CCHIT.

The consultant's report suggests that the County should limit further investment in the current EMR system, and we concur.

The prices for purchase and installation of a new EMR system ranged from $1.0 million to almost $1.9 million.

The prices for purchase and installation ranged from $1.0 million to almost $1.9 million, with three of the four prices near $1.1 million. Annual maintenance costs ranged from $40,000 to $80,000. The totals do not include the cost of improving connectivity with HOC to address issues that have hampered the current EMR system.

The one-time purchase and installation prices include additional estimates for costs above the vendor's stated purchase price, to account for costs typically incurred in IT purchases. According to research provided to us by SysLogic, Inc., actual implementation costs tend to be significantly higher than the amounts quoted by vendors. In particular, the cost of product customization, as well as an additional cost for implementation above that quoted by the vendor (generally calculated by multiplying the software costs by a factor of three), needs to be budgeted. Other costs that need to be considered include training, travel, hardware and consulting fees.

Consulting fees (included in the price ranges noted above) are the most significant additional cost that needs to be taken into account. The role of the consultant is that of a project manager for ensuring best practices are followed for product selection and proper installation. SysLogic suggested that $576,000 be added to the product cost for consulting services, which is the estimated cost of two consultants working full-time on the project for one year.

We also contacted three facilities that have implemented EMR systems from these vendors to get their perspectives on the implementation. Their responses ranged from generally satisfied to very pleased with the vendor selected. It was interesting to note that one of these correctional facilities also had to replace its initial attempt at implementing an EMR system purchased from a different vendor. Another county correctional facility

informed us that $3.0 million was budgeted for the system, which may give a reference point for what the County Board may ultimately budget. In that case, the actual cost was about $1.9 million, with program administration giving high praise to the system which is totally paperless and very user friendly.

Estimated Annual Cost to Maintain Current EMR System

We estimate that the cost of maintaining the current system in 2008 will be about $446,000.

If a decision is made to purchase a new EMR system, we estimate that the cost of maintaining the current TIER system in 2008 until a new system can be procured will be about $446,000, as shown in **Table 4**. These amounts assume a continuation of current service levels in 2008, without any attempts to increase or enhance current functionality.

Table 4 Estimated Operational EMR Costs For 2008	
	Amount
Manual medical records maintenance	$335,000
Annual maintenance agreement	$28,000
Contingency for additional support from the current EMR vendor	$15,000
IMSD support (.5 FTE)	$67,600
Software licensing	$500
Total Estimated Cost to Maintain EMR for 2008	**$446,100**

Source: Department of Audit estimates based on 2007 budget amounts, 2004-07 actual cost trends, and IMSD staff cost estimates.

Outsourcing as an Option

The Office of the Sheriff explored an option in July 2007 to outsource all or a portion of the medical and mental health services for inmates at the CJF and HOC. This included outsourcing medical records management. The request for proposal stated that the vendor would be required to have an electronic medical records system to which the current EMR data can be migrated at the vendor's expense, or utilize the Sheriff's Office's existing EMR. Also, it states that any enhancement to

the current EMR system to accommodate the vendor's current business practice will be at the vendor's expense.

According to the Sheriff's Office, this effort is on hold as none of the proposals received were considered responsive. Reissuing the RFP sometime in the future would not significantly impact any decisions relating to the current EMR if a responsive vendor elects to continue using it. Current system problems would still need to be addressed. However, a decision to purchase a new EMR system could possibly be averted if a responsive vendor is found to take over EMR management, and the vendor elects to utilize its own EMR system.

In either scenario, it should be emphasized that the County would still be responsible for ensuring compliance with the Christiansen consent decree relating to providing adequate medical care to inmates. Thus, if a vendor uses an alternative EMR system, it may be prudent to involve the court's medical monitor in reviewing the vendor's EMR system to assure it provides the necessary features and controls for administering proper health care to inmates.

Conclusion

Outsourcing the medical and mental health unit, including EMR, presents additional risks that need to be carefully weighed before moving ahead if a vendor chooses to use its own EMR system. On the other hand, simply maintaining the current EMR, given its current condition and the health care risks noted by SysLogic in its report, does not appear to be a viable long-term solution.

The best solution lies with a coordinated effort in applying the lessons learned from this experience toward the purchase of a new EMR system.

We believe that the best solution lies with a coordinated effort involving IMSD and the Sheriff's Office in applying the lessons learned from this experience toward the purchase of a new EMR system. Critical in this approach is completing the up-front planning steps necessary for a successful EMR implementation that have been discussed in this and the appended consultant

report. This includes the selection of an EMR system that provides the best match of offered functionality with the needs for quality inmate health care with input from management and staff who routinely use the system.

Exhibit 1

Audit Scope

In response to County Board Resolution 07-179, the Department of Audit conducted an audit of the development, implementation, and direct and indirect costs of the electronic medical records (EMR) system being implemented for inmate medical records at the Criminal Justice Facility and the House of Correction. The development and implementation aspects of the audit were performed by an outside vendor under contract with the Department of Audit. The audit was conducted under standards set forth in the United States Government Accountability Office *Government Auditing Standards (2003 Revision)*.

We limited our review to the areas specified in this Scope Section. During the course of the audit, we:

- Reviewed County Board files, reports and contracts concerning Electronic Medical Records.

- Reviewed Adopted County capital and operating budgets regarding the implementation of Electronic Medical Records from 2000 – 2007 and 2008 County Executive's Budget.

- Reviewed the Request for Proposal of Electronic Medical Records and the Request for Proposal for Inmate and Psychiatric Services.

- Reviewed audits and reports concerning Electronic Medical Records from other institutions.

- Hired and worked with a consultant from SysLogic, Inc., to review the technical and function portion of the Electronic Medical Records System.

- Attended an annual training session for the nurses, referred to as "Enrichment Days" at the Office of the Sheriff's Training Academy, which included a review of EMR training.

- Interviewed clinical and technical users of the EMR system from a varied background such as nurses, nurse practitioners, physicians, psychiatric social workers and system programmers.

- Interviewed or corresponded with management staff from the Office of the Sheriff, Information Services Management Division and Sequest Technologies, Inc.

- Interviewed union representatives from the Wisconsin Federation of Nurses and Health Professional (WFNHP) and reviewed correspondence from the WFNHP.

- Researched state statutes and local ordinances applicable to EMR, and inmate health in correctional facilities.

- Reviewed documents provided by Sequest Technologies, Inc. related to the Totally Integrated Electronic Record (TIER) system, and its implementation.

- Reviewed payroll and invoices from 2004 – 2007 for costs associated with implementation of EMR.

- Projected costs needed for continuation of current system.

- Contacted four companies selling EMR systems for a correctional institution environment for general cost and features information.

- Contacted three correctional institutions that have implemented EMR systems recently for feedback on their purchase experiences.

- Interviewed representatives of the National Commission on Correctional Health Care (NCCHC) and the Certification Commission for Healthcare Information Technology (CCHIT).

David A. Clarke, Jr.
Sheriff

DATE: February 5, 2008

TO: Jerome J. Heer
             Director of Audits

FROM: Inspector Kevin A. Carr

SUBJECT: Audit of Electronic Medical Records System
             January 2008

The audit report of the electronic medical records system includes two recommendations.

The first recommendation is that if the County Board decides to replace the existing EMR system with one that better meets the needs of the Sheriff's Office and the HOC, the Sheriff's Office is to work with IMSD to (1) identify the specific goals, objectives and desired functionality for a replacement EMR system, (2) properly research EMR systems that meet stated goals, objectives and functionality, and document the selection process, and (3) prepare a detailed implementation plan that includes input from all pertinent system users.

The Sheriff's Office agrees to continue to work with IMSD to upgrade/improve the existing EMR system or to replace the existing EMR system, whichever option the County Board chooses to follow.

The second recommendation is that the IT Steering Committee develop formal guidelines for County Board consideration, for use by all County departments when considering investments in new computer information technology systems, and for enhancing existing systems. The guidelines, in the form of a policies and procedures manual, should include as a minimum a requirement to obtain IMSD technical assistance to better estimate the overall cost to purchase and implement the system before any funding request. The extent of IMSD technical assistance should be predicated by the size and complexity of the function.

The Sheriff's Office recommends the IMSD assume a leadership role in all major IT system projects. Individual County departments do not have staff with sufficient skills to oversee complex IT projects.

<u>Other Comments</u>

The Sheriff's Office does not agree with several comments included in the audit report.

The audit report questions whether the EMR vendor selection was independent. The report offers four points in support of this statement and concludes that the Sheriff's Medical/Mental Health Program Administrator tightly controlled the vendor selection process and should have recused himself from the selection process because of past associations with one vendor. The audit report appears to take advantage of a lack of available documentation detailing the vendor selection process to imply that the selection was flawed.

However, in point 1 the audit report reveals that 10 to 15 people served on the RFP evaluation committee. This is an unusually large number of evaluators for an RFP process and would indicate that the Program Administrator was looking for input from many individuals. This is inconsistent with the conclusion that the Program Administrator sought to tightly control the selection process.

Point 2 states that IMSD staff was involved only to provide infrastructure support and to create the interface to CJIS; and states that IMSD staff interviewed did not know why IMSD was not involved to a greater extent.

The claim that IMSD was not appropriately involved in the EMR system project is contrary to the understanding of Sheriff's Administration.
1) The appropriation transfer request narrative written by the Department of Administration and submitted to the County Board in September 2003 includes the statement "Information Management Services Division (IMSD) has been working with the Sheriff's Department to implement the new system."
2) An e-mail from Clare O'Brien, who was in the Department of Administration at the time, to Mary Reddin and Liz Thundercloud of IMSD dated October 8, 2003 states "A few months ago Les Lucas, Deborah Lewis, Adrian Warnier and Mike Kalonick and I met to discuss IMSD's involvement" in the EMR project.
3) A status report on the EMR project dated January 20, 2005 includes the statement that "Mr. Kalonick had worked with not only SeQuest Technologies, Inc but also with DAS-IMSD. James Binger was the lead technical person from IMSD on this project. Mr. Binger retired from IMSD on August 18, 2004. Adrian Warnier replaced Mr. Binger in September of 2004."

If IMSD was not appropriately involved in the project, someone from IMSD should have contacted the Sheriff's Office with their concerns.

Point 3 speculates that the cost factor (40%) could have been over-inflated in announcing the results of the RFP review so that choosing the vendor with no correctional-based experience appeared justified. There is no proof that this occurred. The audit takes advantage of the lack of documentation to infer that the selection process was flawed.

It is normal practice in the Sheriff's Office to receive an RFP response in two parts. One part addresses the technical components of the proposal. The other part addresses the cost components. This allows the evaluation committee to review and rate the technical response on its own merit without cost concerns. All RFP responses that meet the technical requirements of the RFP request are then ranked by cost. The recommendation of the RFP committee is then presented to the Sheriff and eventually to the County Board for approval.

There are too many people involved in this process to conclude that the Program Administrator manipulated the scores to favor any particular vendor. In addition, the points allotted to cost are established in the request for proposals document, prior to receiving any responses.

Point 4 states that the Program Administrator had a prior working relationship with the lowest bidder prior to County employment according to the other vendor that submitted a bid on the EMR project and therefore should have recused himself from the selection process.

If this was true, the Sheriff's Office agrees that this association should have been revealed. However, the Medical/Mental Health Program Administrator was tasked with oversight of all inmate health care for the Sheriff's Office and the House of Correction. He was the only individual in the Sheriff's Office with the knowledge of inmate health care and medical systems to undertake the implementation of an Electronic Medical Records System. In addition, no vendor raised objection to the Program Administrators involvement in the selection process or challenged the recommendation of SeQuest as the EMR vendor at the time.

Fiscal Analysis

The audit report estimates that the costs associated with the EMR system from 2004-2007 total approximately $1.3 million compared to a budget of $1.2 million resulting in a cost over run of approximately $110,000. However, the actual cost estimate includes IMSD staff time costs of $532,962 based on labor hours of existing staff including fringe benefits costs that include "legacy" costs for retired county employees. Therefore, the Sheriff's Office concludes that the EMR project remained reasonably within budget from 2004-2007.

The audit report also estimates that the actual savings realized from the EMR system from 2004-2007 is approximately $1.1 million compared to the original projected savings of $2.1 million resulting in a shortfall of approximately $1.0 million. The Sheriff's Office believes that the audit has understated the actual savings realized from the EMR system.
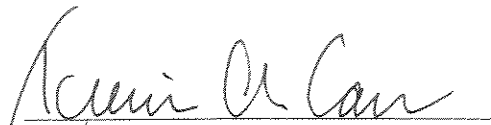
In 2002 the Sheriff's Office paid Pyramid HIM Services over $790,000 to manage inmate medical records. In 2003, the Sheriff's Office paid Pyramid HIM Services over $750,000

to manage inmate medical records. The original EMR proposal stated that contract services would be reduced $650,000 instead of $750,000 because we anticipated that $100,000 would be spent to manage inmate medical records even after full implementation of an Electronic Medical Records system. The audit has used all current costs for temporary help when computing savings instead of reducing these costs by $100,000 each year.

The 2007 costs were based on a budget for temporary help of $335,000 instead of actual expenditures of $280,000 resulting in understating savings by $55,000.

The 2005 adopted budget included the abolishment of 4 Unit Clerks at a savings of $160,000 per year and a $200,000 reduction in the use of temporary help nursing services per year due to the implementation of the EMR.

This results in additional savings of over $1.5 million from operation of the EMR from 2004-2007 that was not included in the audit report. If these savings are included, the estimated actual savings would be $2.6 million compared to the original projected savings of $2.1 million resulting in a savings surplus of $500,000.

Inspector Kevin A. Carr
Milwaukee County Sheriff's Office

Date   :   February 4, 2008

To   :   Jerome J. Heer, Director of Audits

From   :   Dennis John, Chief Information Officer, Information Management Services Division

Subject :   Information Management Services Division Response to Audit of the Office of the Sheriff Inmate Health Care Unit Electronic Medical Records System

Background
The Information Management Services Division (IMSD) appreciates the thorough and professional review and analysis performed by the Department of Audit and SysLogic regarding the planning, development, implementation and costs of the electronic medical record (EMR) system at the Criminal Justice Facility and the House of Correction. Furthermore, IMSD values the opportunity to work with the Office of the Sheriff to make process oriented and fact-based decisions about the electronic medical records system going forward.

IMSD believes that there have been gaps in the County's ability to fully adhere to all appropriate project management practices and to capitalize on the resources of IMSD. Issues on technology related projects that require increased staff and management attention include:
- Project justification and organization
- Commitment and involvement of stakeholders and sponsors
- Adherence to County approved RFP, purchasing and contracting procedures
- Clarity of scope and control of changes
- Accuracy of estimates, availability and commitment of resources
- Upfront detailed requirements defintion
- Management of work plan, issues and risks
- Communication
- Quality assurance

The component most critical to success of any project is full commitment and participation of all sponsors and stakeholders, from leaders to users through all phases of the lifecycle of a project. For IMSD to add value to a project, we need close working relationships with all stakeholders, especially sponsors, based on open communication and collaboration.

Response to Audit Recommendations
IMSD fully supports the audit recommendation that the Sheriff's Office work with IMSD to (1) identify the specific goals and objectives for a replacement EMR system, (2) research EMR systems that meet the goals and objectives, and document the selection process, and (3) prepare a detailed implementation plan that includes input from all pertinent system users. IMSD is committed to leveraging and sustaining a partnership with the Sheriff's Office to build a long-term viable EMR solution.

Furthermore, IMSD agrees with the audit recommendation to develop policy guidelines for IT investments for County Board consideration. The process would include working with the IT Steering Committee, Department Heads, Managers, Analysts, Department of Administrative Services, Department of Audit, Corporation Counsel, Procurement Division and representatives from the County Executive and County Board.

With departmental collaboration and involvement, IMSD will move toward a more strategic role on technology decisions.   When we make the commitment to provide time and appropriate resources on the front end, we will be able to select projects that will be successful. The cost of resources and the time to analyze and plan will reduce the risk of having to restart or abandon failed projects.

We are in the process of developing a vision for successful IT projects through the leadership of the Project Management Office (PMO) and the cooperation of business and IT. IMSD is moving toward a more strategic role with all departments on technology decisions.   To achieve that role, we are finalizing the proposal for adoption of project criteria and technology standards to be presented to the IT Steering Committee and County Board to be used countywide.

We agree to submit a progress report in six months.

Dennis John, Chief Information Officer
Information Management Services Division

cc: Sheriff David A. Clarke, Jr.
         Cynthia Archer, Acting Director, Department of Administrative Services

Functional & Technical Assessment

of the

Milwaukee County Sheriff's Office
Inmate Electronic Medical Record

Prepared by
SysLogic, Inc.
November 19, 2007

Technology with a Human Touch

Table of Contents

Executive Summary

SysLogic, Inc., worked with the Milwaukee County Department of Audit to perform a high-level assessment of the TIER electronic medical record (EMR) from Sequest Technologies, Inc. (Sequest). The TIER system is used by the Health Services Division of the Milwaukee County Sheriff's Office (MCSO) to manage health records for inmates at the Milwaukee County Jail and House of Corrections (HOC). Our work included process, functional, and technical reviews of the system based on interviews with Milwaukee County employees, system demonstration, and reviews of system and project documentation.

TIER has allowed MCSO to make significant progress toward achieving critical goals of standardizing clinical documentation, tracking inmate health services, and conducting quality reporting. However, gaps in the software's performance and functionality have led to numerous concerns by clinical users and IMSD support staff. The following table highlights the findings and presents a rating of the risk each focus area presents to the County moving forward.

Summary of Findings

Focus Area	Assessment	Primary Reason	Forward Risk
Vendor Selection Process	Fair	• Criteria qualitative, cost primary driver • No user involvement in requirements	Medium
Implementation Process	Fair	• Gaps in requirements, design, testing, training	Medium
Vendor Fit	Poor	• Not an EMR specialist • Technical support variable	High
Current Processes	Fair	• Some improvements over implementation • Lack of standardization	Medium
Functional Fit	Fair	• System flexible • Many features not implemented • Missing integrity and safety checks	High
Technical Performance	Fair	• Performance unacceptable at HOC • Large amount of unsupported custom code	High
Business Fit	Fair	• Some goals achieved • Lack of comprehensive business requirements	Medium

Recommendations

Although TIER meets a subset of MCSO's functional requirements for an EMR, numerous system and vendor concerns have been identified during this assessment. We recommend that the County adopt a strategy of replacing TIER with an alternate EMR. Specifically, we recommend the following actions be taken in response to our findings.

1. Create a structured team that focuses on driving organizational value of the EMR to review the findings of this assessment and confirm the proposed EMR replacement strategy.
2. Create a master project plan to determine the general timeline and budget to implement the EMR strategy.
3. Limit continued investment in TIER to those items required to maintain the current functionality or address immediate patient safety concerns.
4. Address performance issues at HOC in alignment with long term strategy.
5. Implement process and role changes for TIER usage and support in alignment with long term strategy.

1. Background

In 2002, the MCSO Program Administrator for Health and Mental Services (Program Administrator) initiated a project to implement an electronic medical record (EMR). Late in 2003, following a two-phase vendor selection process, funding was approved and contracts were signed between Milwaukee County and Sequest for the development, acquisition, and implementation of the TIER EMR. Implementation began in 2004, and the initial go-live took place on December 12, 2004. The goals of the EMR included improvement of inmate medical services and improvements in tracking and documentation of inmate health services. One driver for the project was to ensure compliance with the Christensen consent decree which settled a 1996 class-action suit involving inadequate medical care for prisoners.

Since December 2004, MCSO and IMSD staff has identified numerous issues with the EMR. Formal complaints were filed with MCSO management and with the Milwaukee County Board by the Wisconsin Federation of Nurses and Health Professionals (WFNHP) in December 2004, April 2005, April 2006, and February, March, and May 2007. In April 2007, the County Board resolved to conduct an audit of the EMR selection, development and implementation. The Milwaukee County Department of Audit engaged SysLogic to provide an assessment of the implementation process and the functional and technical aspects of the system.

2. Methodology

The process review compared the implementation and management of TIER against best practices for systems development and project management. The functional review included system fit with current workflows, reported system issues, and comparison against other EMR software. The technical review involved an evaluation of the hardware, network, and software infrastructure on which TIER is built.

Seventeen user interviews provided the majority of the information for this assessment. The audit team chose interviewees from a variety of clinical and technical disciplines and with varied involvement with the project. In addition, interviewees were selected from both management and non-management roles. Table1 summarizes the interviewees by role and tenure with the County.

SysLogic reviewed available documentation about the system and implementation. Significant information was obtained from the RFP, the Sequest RFP Response, project issues lists, project status reports, testing documentation, TIER system documentation (Sequest), and letters from the WFNHP and court-appointed medical monitors for the correctional facilities. Information requested from Sequest starting in late August 2007 was provided on October 25, 2007.

Industry research involved review of EMR capabilities and cost from a variety of vendors; review of EMR vendor rankings from KLAS[1] and the Commission on Certification of Health Information Technology (CCHIT)[2]; discussion with EMR vendor(s) regarding correctional facility implementation; and review of published literature on EMR benefits and justification.

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[1] KLAS is an independent organization that monitors vendor performance for the healthcare market (www.healthcomputing.com).
[2] CCHIT is an independent, private-sector organization who provides objective certification of healthcare information technology (www.cchit.org).

Table 1. Interview Subject Summary

Functional Role	RFP Committee Members	Implementation Team Members	Number at MCSO/IMSD pre-EMR (12/04)	Number joined since EMR (12/04)
Clinical (n=9)	2	1	6	3
IMSD (n=4)	N/A	2	4	N/A
MCSO – IT (n=1)	1	N/A	1	N/A
MSCO Management* (n=3)	N/A	N/A	2	1

*Medical Director considered clinical for this summary as his role on the implementation was primarily for clinical input. Director of Nursing is considered management as her role is primarily administrative.
N/A – not available or applicable.

3. Summary of Findings

3.1 Vendor Selection Process

In 2003, requests for information (RFI) were issued to a number of EMR providers. No information about the vendor selection for the RFI was available. Participants in the RFI process recall six vendor demonstrations followed by a ranking session with the RFP committee present. The RFP committee consisted of 10-15 individuals representing MCSO administration, providers, nursing, and social workers. One MCSO deputy/information systems analyst was on the committee although no one from Milwaukee County Information Management Services Division (IMSD) participated. The Program Administrator managed the vendor selection process.

Ranking forms for the vendors were available from one participant but no documented record of the final rankings is available. All interviewees reported that the Program Administrator had stipulated a budget limit of $500,000 for the EMR. Participants interviewed reported that while the GE Logician product was clearly the superior product, their estimated pricing was close to $1M, far exceeding the $500,000 amount that was allowable for the EMR. There were some concerns about the functionality of the GE product; however, respondents agree that price was the deciding factor in the vendor rankings. The Inspector for MCSO was not aware of a pre-determined budget amount for the EMR and stated that the budget request was developed following receipt of the proposals in the fall of 2003.

 Following the RFI ranking process, the participants interviewed were not asked to create or review any documentation for the formal RFP. The RFP contained detailed technical and functional requirements both for usability and specific EMR functionality. The origin of the detailed requirements is unknown; however, those interviewed believe that the Program Administrator wrote them. Sequest states that they were not involved with the development of the RFP or requirements in any way. This RFP was submitted on September 26, 2003 to the top three vendors out of the original ranking, of which two responded with a proposal. None of those interviewed recalls reading the detailed RFP or proposal details.

The funding approval memorandum, dated November 24, 2003, states that Sequest was chosen over the other respondent on the basis of cost. The cost was represented in an initial capital investment of $495,000 and operating savings of $130,000 for 2004. The estimates for ongoing cost savings of $470,000 per year for FY 2005 and beyond are based on the assumption that the $650,000 annual contract for medical records personnel would be cancelled.

According to the contract between the County and Sequest, the total first year payment of $494,542 was to be made according to schedule below. Following the first year, an annual fee of $25,000 was to be paid to Sequest for support and maintenance.

| Milestone	Amount
Commencement of work on the contract	$200,000
Acceptance of the testing database by the County	$150,367
Completion of training	$72,088
Thirty (30) days after "go-live" date	$72,087

3.2   Implementation Process

The core implementation project team consisted of the Program Administrator and Sequest staff with input from clinical users as required. Status reports were provided verbally from the Program Administrator to MCSO administration and project team members did not have input to the status reporting. According the current MCSO Medical Director, he and the acting Nursing Director were invited to provide input to the development process only in confirming that forms developed within TIER matched the paper forms in use. According to several interviewees, the Program Administrator specifically asked for the system to replicate the paper forms currently in use rather than complete workflow analysis to determine detailed requirements. Documentation provided by the vendor reflects that at least the booking and health assessment workflow was defined in detail to determine requirements.

The MCSO Medical Director stated that he did not participate in requirements definition, workflow definition, screen design, testing, or implementation planning. Documentation provided by Sequest suggests that the Nursing Director and at least two other physicians were involved to a certain extent in requirements gathering. The documentation also indicates that later in the implementation, the Medical and Nursing Directors provided detailed feedback in revising clinical forms in TIER during testing and design refinement.

IMSD staff was involved only to provide infrastructure support and to create the interface to the Criminal Justice Information System (CJIS). IMSD staff indicated in interviews that they did not know why IMSD was not involved to a greater extent. Several IMSD managers participated in early planning sessions with Sequest, including representatives from the infrastructure and applications areas. The MCSO IT staff had been reassigned early in 2004 as part of the consolidation of IT functions to IMSD. As a result, the analyst on the RFP team had been assigned to another department and was not available to work on the implementation project.

The first indications that there were issues with the implementation came in the spring of 2004 as it became apparent that the project team would not meet the original implementation deadline of June 2004 (see Figure 1). The launch was delayed several times during the course of 2004 with a final launch date of December 12, 2004. IMSD and MCSO staff members report that concerns raised about issues with the system, in particular the CJIS integration were ignored by the Program Administrator with the reassurance of the Sequest project manager. Although records of system testing were provided by Sequest, the status reports provided stop after September 2004 and do not resume until February 2005. It is not known if the CJIS integration issues were documented or communicated beyond the Program Administrator during this time frame.

Figure 1. TIER Implementation Timeline
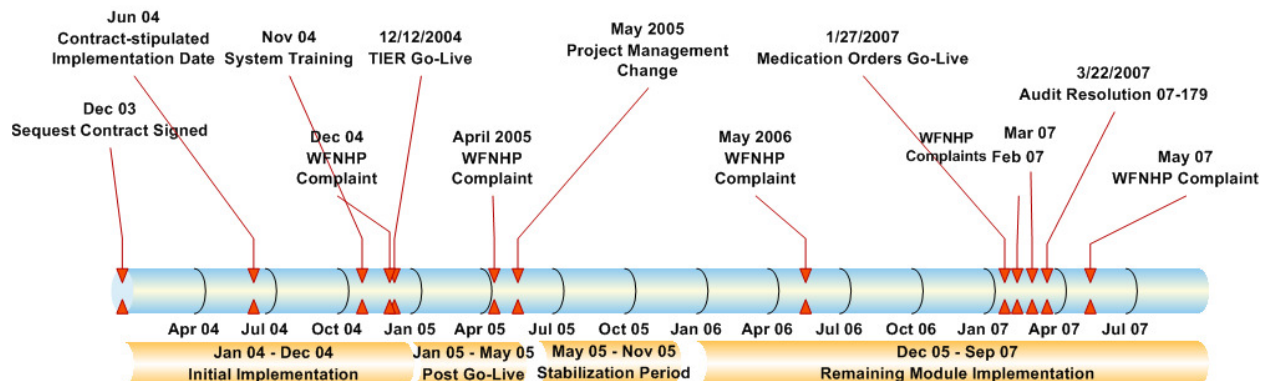
Training of clinical users occurred in the late fall of 2004. Training was provided by Sequest staff. Records from the training sessions were not located. Several of those interviewed reported that training was held at a time when the system was not functioning completely and that they were not given hands-on access to the system before go-live. All interview subjects agree that training was inadequate. A letter from the WFNHP to the Milwaukee County Sheriff, dated December 8, 2004, documents some issues that the nurses observed with the system during training. The memo specifically criticizes the medication orders functionality which was not released during the initial implementation. A memorandum from the Program Administrator, dated December 11, 2004, announces the workflows that would be implemented in TIER and outlines the support processes for the launch. This memorandum mentions that the medication orders would not be available initially, but would be launched by the end of December 2004.

At the time of implementation, nursing management was in flux. The nursing director had retired in 2003 and an acting director was in place who was also acting as a nurse educator. Through the first half of 2004, staff retirements, particularly at the jail, led to a shortage of experienced nursing staff. Nurses who were working at the time do not remember hearing about the EMR until the training late in 2004. The current Director of Nursing started on December 13, 2004, one day after go-live, but was not told about the EMR project during the interview process in the fall of 2004.

Immediately after implementation, the major issues which occurred involved the loss of data from newly booked inmates. For a new booking, staff create a new record in TIER and record health assessments in that record while awaiting positive identification from the state database. The assessments from these bookings are eventually tied to an existing or new person in CJIS and TIER and all prior records for that inmate rolled into the proper record. Flaws in the design of this rollup led to numerous "orphan" records, records present in the system but not matched properly to inmates. Orphan records had to be manually tracked down and re-assigned by IMSD staff. To users, it appeared that data was not being saved because it was not retrieved with the inmate's record as expected. Orphan record issues continued in large numbers through November 2005 at which time fixes to the system were in place and IMSD had re-matched the majority of orphan records.

MCSO responded to the issues with the system by requesting re-instatement of their IT analyst in January 2005 to work on issue resolution and training documentation. In addition, further assistance from IMSD staff was provided. In April 2005, a complaint was filed with Milwaukee County by WFNHP, describing major system issues and requesting that the system be shut down. MCSO requested further assistance from IMSD in May 2005. IMSD assigned a full time project manager to TIER and provided three other

IMSD team members. The MCSO IT analyst remained on the team full time assist with functional issue resolution, training and form development. Sequest also made a project management change in May 2005, assigning a new project manager to the County. The items in the WFNHP complaint were given top priority by the new team.

The project implementation from May through November 2005 focused on system stabilization, fixes to broken forms, and resolution of the orphan record issues. From November 2005 through May 2007, the team implemented several enhancements including replacing the reporting module, the pharmacy interface, and implementation of the medication ordering module in January 2007. Work on the scanning module and lab interface occurred, however, neither has been completed. The medication administration reporting module was postponed deliberately until the medication orders module was in place and functioning to user satisfaction.

3.3 Vendor Performance and Fit

Sequest support has been variable throughout the implementation and post-implementation periods. Immediately following the go-live and the departure of the Program Administrator, support in addressing the issues present at go live was difficult to obtain from Sequest. The issue reportedly centered around the final outstanding invoice for the implementation which was supposed to be paid 30 days after the system went live. This invoice was not paid due to the incomplete implementation. According to MCSO, once the invoice was paid in the spring of 2005, Sequest was more responsive to requests for assistance.

Since the spring of 2005, Sequest support for the IMSD and MCSO team managing TIER has not been optimal. Delays in technical assistance, inability of the vendor to solve some technical problems, and variable skill level of Sequest support staff have been cited as ongoing issues. Disputes over whether certain requests were enhancements versus functionality that should have been delivered have contributed to poor relations between the vendor and Milwaukee County. In addition, IMSD feels that Sequest moved the project from an implementation state to a completed project in maintenance prematurely. Recently, technical support has improved due to a new member of the Sequest support team.

Sequest is primarily a vendor of behavioral health solutions. The venture with Milwaukee County represented the vendor's first experience in corrections and their first experience in a primarily medical setting. They have not installed the correctional version of the TIER product for any other customers although they have a number of recent contracts in behavioral health and social services. Several electronic medical records experts were questioned, including physicians and consultants in the field, and none had heard of Sequest. KLAS is an independent organization that monitors vendor performance for the healthcare market. Sequest is listed only as a behavioral health vendor in KLAS and there is not enough information on them to achieve any kind of ranking. In addition, Sequest has not received certification of their products by the Certification Commission for Healthcare Information Technology (CCHIT). Approximately 40% of ambulatory (inpatient) EMRs and 25% of acute care (inpatient) EMRs are certified by CCHIT, according to a November 2007 industry publication.

3.4 Current Process Assessment

The current processes surrounding TIER include workflow and clinical processes for the end users and technical processes for support and development of enhancements to TIER. While the evaluation of clinical and management processes themselves are out of the scope of this assessment, there are several observations around policies which are appropriate. Several interview subjects noted that nursing policies

and procedures have not been revised since 2003 and do not reflect use of TIER in all cases. Some functional issues identified are a result of ambiguity in the preferred clinical procedure. Standardized procedures must be available for the system to support workflows adequately. Some differences in documentation methods occur among providers. For example, some may use assessment forms more than the more free-form progress notes while others avoid the assessment forms.

Training documentation and process varies by clinical discipline. Training of nursing staff on TIER is accomplished through the orientation process. Training documentation is updated periodically and is provided to nurses with their orientation manual. In addition, the nurse educators have started to include a refresher TIER training during the nursing enrichment days, an annual mandatory training event. For major releases, such as the Medication Orders module, scheduled in-service trainings are held. Nurse practitioners and physicians are expected to learn the system from co-workers during the orientation period as well. No training documentation was available for providers; however, the new physicians interviewed stated that learning the TIER system was relatively easy. Social workers are also taught how to use TIER on the job; no issues were reported regarding training of this group.

The processes surrounding TIER technical support and development have improved substantially over the initial implementation period. The IMSD team with the assistance of the TIER committee has implemented a structured process for reporting, ranking, and documenting issues. A prototyping process is in place for new development, such as forms or reports, with approval steps from nursing or medical representation, as appropriate. The support process is still informal with issues reported directly to IMSD, MCSO IT staff, or nurse educators at each location. Some users report issues via email while others communicate verbally, making tracking difficult. Issue resolution is documented by IMSD. Communication of fixes and enhancements to end users is not consistent since it relies on chains of communication rather than direct end-user involvement.

3.5 Functional Assessment

3.5.1 Implementation Status

The majority of interview subjects stated that the TIER system meets many of their needs for electronic medical records but that finishing the implementation is critical. The current implementation requires most information to be in the EMR, but selected portions of the record are still in paper charts, notably medication administration records, outside records, and lab orders and results. Each interviewee had particular issues with the system and priorities for what to fix differed, particularly between providers and nurses. Table 2 below summarizes the major EMR features planned for TIER with the status, target date, and comments on the status.

Table 2. Electronic Medical Record Module Status

Module	Status	Launch / Target Date	Comments
Basic Documentation and Viewing of EMR	Installed	12/12/04	Major record identification issues resolved. Functions such as progress notes, to do lists, triage, scheduling, and assessments in place.
Medication Orders	Installed	January 2007	Improved implementation process. Still have some issues to address (see below).
Medication Administration Reporting (eMAR)	In progress	Early 2008	Team wants to wait for issues with medication orders to be resolved before launching eMAR. Full workflow analysis should be done during requirements and design of eMAR module.
Lab Interface – Orders and Results	On hold	Unknown	Lower priority at this point. Issues with connectivity are root cause. Recent changes to lab forms may cause rework of interface programming.
Scanning	In progress	Unknown	Hardware and business process for scanning outside documents not available. TIER software requires one fix to launch.
Reports	In progress	Ongoing	Some reporting present at launch but inadequate. Much effort ongoing to working on reports. Driven by NCCHC[3] accreditation requirements.
Assessment and Protocol Forms	In progress	Ongoing	MCSO working on protocols. Many assessments available and work to organize and refine underway.

3.5.2 Issue Analysis

It is impossible to evaluate the success of the current EMR without some understanding of the issues that have plagued the system historically. Some resentment of the system appears to stem from issues which have been resolved or issues which have been in place for years but have not been addressed to the users' satisfaction. In addition, several of those interviewed, both clinical and IMSD, have noted the tendency for new bugs to appear when other features are added or modified. As described in section 3.2, the major issue present during the first year of the TIER implementation was the loss of data due to improper rollup of patient records after booking. While the majority of this data was eventually recovered and matched with the proper inmate, users continue to report data loss periodically. After the rollout of the Medication Orders in January 2007, WFNHP reported record loss again. IMSD staff members were unable to substantiate any claims of data loss due to the medication orders module.

The major categories of issues identified in TIER are summarized in Table 3. Issues have been identified by a number of sources, including project documentation, user interviews, WFNHP complaints, and letters from the court-appointed medical monitor (Medical Monitor) responsible for ensuring Milwaukee County compliance with the Christensen consent decree. One aspect of the issue analysis that is difficult to represent is the criticality of the issue. Most usability issues are not critical but represent challenges and opportunities for user error. Poor usability can also diminish efficiency of clinical staff. Prioritization of

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[3] NCCHC is the National Commission on Correctional Healthcare which provides voluntary accreditation of healthcare facilities in correctional institutions.

issues is reflected in IMSD documentation; however, nurse educators and others in more direct contact with users do not document and prioritize issues in a standardized manner. Several issues which present a risk to patient safety are described in more detail in this section.

In one example provided during the assessment, a nurse reported an issue in which medication ordered for one inmate was found on the paper medication administration record for another inmate. A gender difference allowed the nurse to identify the error before medications were administered. The error was traced to a mistake in data entry by the booking clerk who is required to manually type booking numbers into CJIS which then access records in TIER associated with the booking. These records are then rolled into the proper inmate. The need to merge patient records is common in hospitals, particularly in the emergency room; however, it has been an ongoing challenge for the County with TIER. The manual data entry step has the potential to introduce errors, especially since the system does not validate the matches on the basis of gender or other information.

The Medical Monitor submitted an assessment of the EMR implementation to the attorneys involved with overseeing the Christensen consent decree in September 2006. He describes the issues with the system (see Table 2) and expresses his belief that the TIER developers were building the system from scratch during the implementation. As noted above, WFNHP has brought issues to the County on several occasions. Among the most critical were issues with the Medication Orders module brought forward in February 2007 and May 2007 by WFNHP. All but two of these have been resolved, one of which is under way and one of which needs further explanation to IMSD and may require Sequest input.

Table 3. Electronic Medical Record Module Issues Summary

Issue Category	Identification Date	Original Source	Resolution Date	Comments
Freezing computers and being logged off the system	April 2005	WFNHP	None	Frequency has been reduced but still occurs, especially at HOC.
Lost information / records	Dec. 2004	WFNHP	November 2005	Occasionally, complaints still surface about lost records, usually traceable to data entry errors.
Record mismatches - orders or other information visible in the wrong inmate record	Unknown	Interviews	None	These are caused by data entry errors but still represent a significant source of risk and effort for IMDS staff to resolve.
Duplicate medication orders	January 2007	Nurse emails	None	The system does not prevent placement of duplicate orders and discontinuing orders that are duplicates can be problematic.
No policies & procedures on TIER usage (nursing)	April 2005	WFNHP	None	This is still an issue cited by nurses and some providers.
Usability issues, such as cumbersome medication reorders	April 2005	WFNHP, Interviews	Ongoing	Multiple screens, many clicks to information, difficult printing, inability to filter lists. Items are addressed as prioritized by TIER committee and as staffing permits.
Incomplete EMR – no orders, treatment record, lab orders or results, or scanned documents.	April 2005	WFNHP	None	Other than medication orders, these items are still outstanding. The dual record system makes it hard to know if information is missing or just located in paper chart. Increases potential for errors.
Poor training for system changes	April 2005	WFNHP	Summer 2005	Two nurse educators hired to conduct nurse training. Training for MD's and Nurse Practitioners more informal but new staff report that system easily learned.
Inability to review and print integrated notes and records.	Sept. 2006	Medical Monitor	None	This is still an issue cited by providers.
No treatment plan documentation. Few nursing protocols implemented.	Dec. 2004/ Sept. 2006	WFNHP, Medical Monitor	None	These items are under development by MCSO IT staff with the assistance of the nurse educators.
Inability to support clinical preferences and standards for timing and insulin administration.	January 2007	WFNHP, Interviews	None	Fixes to selected issues may require assistance from Sequest. A workaround for the insulin issue is underway.
Lack of patient safety features, such as data entry validation and drug-allergy warnings.	September 2007	Interviews	None	These features have not been implemented but represent functionality that would typically be present in an EMR.

3.5.3 User Satisfaction

When asked to characterize the system, interviewees stated that the main strengths of the system included the availability of the record in general, the flexibility of the system to meet process and assessment needs, and the To Do Lists which allow team members to communicate and prioritize work. There was general agreement that usability was sometimes an issue and that small tweaks would be appreciated in many areas. When asked if the system meets their current needs, one user made the analogy to the Microsoft Windows Operating System. He feels like they contracted for Windows 98, Sequest delivered Windows 3.0, IMSD has modified the system to be Windows 95, but what they really want is Windows Vista. This response illustrates what many users feel—that the system works but is not optimal.

Table 4 represents consensus satisfaction with various features of the EMR based on interpretation of interviewee complaints and comments. This does not represent survey data, simply a summary view of the comments heard. A similar evaluation including technical system quality metrics is available in the Technical Assessment section of this report.

Table 4. User Satisfaction with EMR Features

	User Group			
EMR Feature	Providers (MD and NP)	Nursing	Administration*	Social Work
Patient Identification and Demographics	S	N	S	S
Health Data Management	N	S	N/A	S
Availability of Records	S	S	S	S
Completeness of Records	U	U	U	N
To Do Lists	N	N	N/A	N
Scheduling	S	S	S	S
Order Entry/Order Management	U	U	U	N
Reporting	S	N/A	S	N/A

U = Unsatisfactory	N = Needs Improvement	S = Satisfactory

*Administration refers to the use of the system for reporting as well as administrative purposes such as audits and issue resolution, e.g. not direct patient care.
N/A = not directly applicable

3.6   Technical Assessment

The architecture of the system is client server. The database is Microsoft SQL Server 2005 Enterprise Edition and the application is written in Delphi, a fourth-generation language based on Pascal. The original server had limited capabilities and has been upgraded to one with 16G RAM and 1 Tb of disk space, to ensure capacity for the scanned documents expected when scanning goes live. The old server is now a development server and also serves as the backup environment for disaster recovery. Incremental backups are stored offsite. A comprehensive medication orders

record is exported to PDF hourly so a paper backup of medication orders is always available even if the TIER system is unavailable for any reason. TIER comes with an adapted form of Delphi to create the application forms. CJIS is the only active interface in the system.

The connectivity issues are mainly with the House of Corrections which is connected by a single T1 to IMSD. This line serves all applications as well as Internet traffic and is inadequate to support the required bandwidth. Several options to provide a thin client version of TIER to the HOC are under investigation by the County Chief Technology Officer. Options under consideration include Citrix or Terminal Services. Some comments about TIER being slow at the jail have been made, but these are rare.

IT support staff, both IMSD and MCSO, believe that the product delivered by Sequest was an incomplete product and that the level of development required to get TIER working exceeds the expected workflow configuration for a packaged software installation. The forms delivered with the first go-live also had issues. They were poorly constructed and often Word merges required for printing did not work properly. The fax server module delivered with TIER never worked and has been replaced by a solution based on Microsoft SQL Server Reporting Services and PDF delivery to the pharmacy. The Crystal Reports based reporting feature of TIER also had issues, particularly related to performance, and has also been completely replaced by custom code built in Microsoft Reporting Services. IMSD estimates that close to half of the code in production has been developed or significantly customized by them. IMSD staff also reports that the system is more difficult to maintain than other systems, i.e. new defects are often introduced when fixes or enhancements are made to other components.

The client hardware is ageing; however, the number of client machines in the clinical areas is adequate. The database behind TIER was recently upgraded and IMSD has applied one minor upgrade to TIER itself. A major release of TIER is available from Sequest, however, concerns about custom code and no demonstrated need for new features led to postponement of upgrade. IMSD and MCSO staff characterizes the system itself as "very touchy." It is very easy to break and with minor changes other things generally go wrong. Issues with moving forms from the test database to production were never resolved, even by Sequest staff, and form developers often have to alter forms once they are moved in production.

Original team members feel that the TIER product had been created for a mental health facility and significant changes were required for corrections. It appeared that this was the vendor's first experience with an EMR and items such as integrated notes, medications, lab orders, etc. In fact, Sequest states that the only new development performed for this implementation was to allow for bar code entry of medication administration, biometric authentication, and to allow the user to work disconnected from the system and then reconnect to synchronize data.

Some aspects of the software design have proved hard for IMSD staff to work around. The database was set up as a hierarchical database with one table per form. This resulted in duplicate data and a non-normalized database. This has created difficulties in matching records created in cases where no fingerprint ID was available from CJIS. IMSD has had to make significant changes to the database and there are still issues with keeping records intact. Several examples of non-normalized data were explained by IMSD staff.

Table 5 represents consensus satisfaction with system quality metrics based on interpretation of interviewee complaints and comments. This does not represent survey data, simply a summary

view of the comments heard. IMSD and MCSO IT support staff are included in this analysis since their work depends heavily on the system quality. The evaluation refers to their own use of the system as technicians, not on interpretation of clinical user satisfaction.

Table 5. User Satisfaction with System Quality

	User Group				
System Quality Metric	Providers (MD and NP)	Nursing	Administration	Social Work	IMSD/ MCSO IT
Overall Usability	U	U	S	N	N
Performance (Speed)	U	U	U	U	U
Availability (Up-time)	S	S	S	S	S
Reliability (System)*	N	N	S	S	N
Accuracy/ Consistency (Data)	N	N	S	S	N
Timeliness (Data)	S	S	S	S	S
Maintainability (System)**	U	U	U	N/A	U
Flexibility (System)	S	S	S	S	S

U = Unsatisfactory   N = Needs Improvement   S = Satisfactory

*Reliability refers to the likelihood of a failure during task execution. Inconsistencies or crashes in the system reduce reliability.
**Maintainability refers to the ease of making fixes to the system without breaking other features.

3.7   Business Justification

The expectations of the staff regarding the EMR are varied. Nurses, specifically, have complained that the EMR has made their job more difficult. The justification behind implementing an EMR has been documented in two places and discussed in several interviews. The MCSO Health Services Medical Director states that the drivers for the EMR were related to the National Commission on Correctional Health Care (NCHCC) accreditation process and the court-ordered quality reporting. Audits of timeliness of care, medications, and treatments were difficult due to the multiple manual logs used to track care. Significant staff time was required to track care, requiring overtime due to understaffing. An EMR would allow MCSO to do away with the manual logs and improved documentation quality. The medical director contends that the use of structured forms for documentation may slow down a provider or nurse but greatly improves the quality of documentation with specific questions. Another driver was the need for structured information to compare notes and care between patients.

In accordance with medical director's statements, the RFP states that the reasons for implementing EMR are to:

- Improve documentation
- Eliminate manual logs required to track patient care
- Facilitate reporting for court-mandated care and quality initiatives

The funding request noted the following benefits which were related more to efficiencies and cost savings. While the major benefit was to be cost savings due to the cancellation of the medical records staff contract, several areas of improved efficiency were listed. It should be noted that many of these are only indirectly related to the overwhelming need for more structured, accurate documentation.

1. Notifications when inmates scheduled for care
2. Improvement of documentation for healthcare providers
3. Significant time savings for staff due to copying demographic information to multiple forms and not having to fax orders manually to pharmacy
4. Improved efficiency in scheduling inmates for medical staff
5. Time savings in performing quality studies

Interviews with staff and written documentation from the Medical Director and Medical Monitor confirm that some of the benefits expected from the EMR have been achieved, at least partially. In his September 2006 assessment, the Medical Monitor recommended that the County perform a cost/benefit analysis to determine if they should continue with TIER or look for a replacement. He reiterated these observations during a December 2006 visit. Following the implementation of Medication Orders in January 2007, however, the Medical Monitor communicated to MCSO praise of the IMSD staff for progress on TIER and his belief that the County has received benefits from the system. In addition, he supports completion of the system over replacement due to the enormous effort involved. Table 6 provides an assessment of progress toward the EMR goals.

Table 6. EMR Goal Assessment

Source	Goal	Status
RFP - 1 Funding Request – 2	Accurate and consistent documentation by healthcare providers	Partially Achieved – documentation is significantly more standardized and accessible; however, major pieces missing such as outside documents, medication administration, lab results
RFP – 2 Funding Request – 1	Provide automated notification and tracking of inmate care	Partially Achieved – complete history of contact with inmate available – most records in system except medication administration records, lab results, and outside records
RFP – 3 Funding Request – 5	Time savings/improvement in quality reviews	Partially Achieved – time for reporting has shifted from clinical staff to IT staff to create reports – no accurate calculation of time savings has been performed
Funding Request – 3	Staff time savings – forms completion	Partially Achieved – transcribing of demographics has stopped, but computerized documentation can be slower than paper for some tasks
Funding Request - 3	Staff time savings – pharmacy faxing	Partially Achieved – online orders in place but lack of online MAR adds manual steps to medication process
Funding Request - 4	Improved efficiency in scheduling inmates for medical staff	Achieved – the system has appointment scheduling and a triage list for prioritization of care requests

4. Gap Analysis

4.1   Vendor Selection Gaps

The vendor selection process included a Request for Information sent to many vendors, of which six provided on-site demonstrations. These were ranked and the final RFP sent to three vendors, two of which responded with a proposal. The gaps in the RFP process are summarized below. The RFP Committee had no knowledge or review of the technical or functional requirements in the RFP. Other than evaluating vendors based on demonstrations, they were not given the opportunity to specify and rank features which they felt were important. The vendor evaluation criteria from the demonstrations were reasonable but entirely qualitative. Rankings were done by group consensus and did not correspond directly to stated requirements in the RFP. In the end, all participants agreed that cost weighed much more heavily than other factors. Several RFP committee members stated GE Logician would have been chosen had it been priced within the $500,000 range stipulated by the Program Administrator. All members felt concern that the project was essentially a development project for Sequest since much of the functionality proposed would be built specifically for the county. In the RFP, Sequest is up front about their desire to enter the correctional facility EMR market as a result of the collaboration with Milwaukee County.

The main issue with the vendor selection appears to be that a budget was set for the project well in advance of the RFI process and certainly the RFP process. It is possible that the Program Administrator wished to justify the cost of the EMR entirely through the cancellation of the Pyramid HIM contract. The lack of a quantitative ranking process made quantitative comparison between vendors impossible for any factor other than cost, making it hard to justify spending more on a product just due to general feelings.

4.2   Vendor Performance and Fit Gaps

Several issues are pertinent to evaluating the continued relationship between Sequest and Milwaukee County. The most critical gap is that Sequest is not focused on electronic medical records as much as behavioral health workflows. As noted in the findings, Sequest is not a leading vendor in the EMR field according to industry organizations and experts. Clinical functions, such as allergy medication alerts and insulin sliding scale orders, are examples of the kind of medical functionality which Sequest either does not support or will implement only with additional expenditure. Since their focus is behavioral health, it is likely that more examples of medical functionality will be encountered which Sequest will not automatically include in TIER.

Sequest support to Milwaukee County has been variable. Project and technical support depends on the staff assigned at the time. The transition of the project from an implementation to maintenance mode by Sequest was unclear to IMSD staff and some County staff feel that the implementation is still incomplete despite sign-offs by County staff on each phase of the project. More troubling is the lack of standard EMR features and support for advanced clinical practices which Sequest will not implement except for an additional charge. It is surprising that requirements such as basic data validation and duplicate medication orders were overlooked during the implementation, suggesting vendor inexperience with electronic medical records in a setting with a more medical focus rather than a behavioral health focus.

The gaps in vendor performance are summarized below:

1. Technical and project support is highly dependent on skill level of personnel and not consistent across Sequest.
2. Major issues with vendor-managed implementation process led to incomplete implementation.
3. Confidence in the vendor to support and develop medical records product is low.
4. The TIER product is built on older architecture and programming tools.
5. Sequest has indicated that other clients are on a thin-client version of TIER, but it is unclear if this would be available for MCSO. A thin-client (e.g. Web-based) version would likely improve performance at the HOC.

4.3   Implementation Process Gaps

Many issues with the current system stem from gaps in the implementation process. The gaps are broken down by project management topics.

1. Project Oversight:
    a. The Program Administrator played role of project manager and direct management oversight with no other steering body.
    b. No mechanism existed for stakeholders to address concerns with anyone other than the Program Administrator.
2. Project Management:
    a. The project team was not treated as a cohesive team and often met separately rather than as a group.
    b. Clinical users were not heavily involved in the system implementation from January through August 2004.
    c. IMSD staff was not involved sufficiently, and their concerns with project management and technical issues not elevated effectively.
3. System Design:
    a. Implementation provided minimal workflow analysis and the design was based mainly on paper forms and the existing processes.
4. Testing:
    a. System testing did not include adequate sample or converted data from the CJIS system. Concerns about CJIS interface raised but ignored, leading to mismatched records for months.
    b. Documentation of system testing available, but it is unclear how clinical users were involved with user acceptance testing.
5. Training and Organizational Communication:
    a. Very little organizational communication about the system was performed. Most users were unaware of the project until training occurred.
    b. Training was inadequate and performed on an incomplete system
6. Rollout:
    a. The rollout did not include pilot or parallel period to work out issues. Major system issues identified during full rollout with no paper system backup.
    b. Memo detailing changes with rollout distributed 12/11/04 – one day prior to go-live which did not allow sufficient time to prepare for the change.
    c. The Program Administrator's departure in December 2004 impacted team's ability to address problems quickly after rollout.

It appears that the Program Administrator was over-confident in his ability to deliver the EMR with the assistance of only the vendor. Interviewees have stated that he was reluctant to involve clinical staff in the project partly due to staffing shortages at the Jail and HOC in 2004. In addition, the Program Administrator had announced his intention to separate with the County in September 2004 but agreed to stay on and complete the EMR implementation. This may have contributed to the push for a go-live in 2004 even at the cost of system quality. It appears that the Program Administrator reported some but not all IMSD and clinical staff concerns to MCSO management. The Program Administrator assured upper management that concerns which were communicated would be addressed adequately during the rollout.

4.4 Current Process Gaps

While the current processes for TIER use and development have improved with time, some gaps are evident. The following gaps refer to the use and management of TIER in the health services area:

1. Policies and procedures have not been revised since 2003 and do not reflect use of TIER in all cases.
2. Some functional issues a result of inconsistent or undocumented clinical procedures.
3. Training documentation and process varies by clinical discipline.
4. Documentation preferences vary among providers.

The processes for TIER support and development have improved over the past several years. A working group has evolved which includes IMDS, MCSO IT staff, and representatives of clinical users to investigate reported issues, prioritize and approve enhancements, and communicate changes to users. This group is referred to as the TIER committee by IMSD. Remaining gaps in the technical processes for TIER system support and development include:

1. The existence and role of the TIER committee not known among many users.
2. TIER committee members do not appear to follow standard documentation practices and are unaware of what other committee members are working on.
3. The TIER team lacks business analysis skills to document requirements.
4. A proper support process has yet to be established; issues are logged via email, phone calls, and other informal methods rather than through help desk tracking system.
5. IMSD staffing insufficient to continue work on support, reporting needs, and future module development.

The clinical and management process gaps may be difficult to address but are the root of many complaints, particularly those of WFNHP. On the technical side, IMSD has the skills to address these gaps, given staff availability. MCSO could benefit from additional business analysis and project management assistance to continue to address the need of the TIER implementation.

4.5   Functional Gaps

TIER, as implemented, falls short of the required functionality when compared to the RFP, the Sequest proposal, user expectations, and standard EMR functionality. The major functionality missing from the system is summarized below. A detailed list of EMR functionality has been compiled by the Certification Commission for Healthcare Information Technology (CCHIT) as criteria for vendor certification of EMR products. As stated previously, many highly-ranked EMR products have obtained CCHIT certification although TIER has not.

Table 7. Missing/Inadequate EMR Functionality

Functionality	Stated in RFP	Standard EMR Functionality[1]	Available in TIER[2]	Comments	Consensus Priority[3]
Medication Administration Reporting	Yes	Yes	Yes	Manual process inefficient and prone to error	High
Medication – allergy conflict alerts	No	Yes	No	Considered mandatory EMR functionality	High
Data entry validation	Yes	Yes	Yes	Possible to add validation to some fields.	High
Treatment Orders / Care Plans / Protocols	Yes	Yes	Yes	In progress.	High
Medication re-orders without significant rework	Yes	Yes	No	Very time-consuming. May require more development.	Medium
Storage and retrieval of scanned documents	Yes	Yes	Yes	Hardware, software, network challenges.	Medium
Review and print integrated notes, records.	Yes	Yes	No	May be possible with custom development	Medium
Lab orders and results	Yes	Yes	Yes	Issues with County connectivity to lab.	Low

[1] Item cited in 2007 standards for Ambulatory EMR certification by the Certification Commission for Healthcare Information Technology (CCHIT).

[2] May require additional development cost from Sequest.

[3] All interview subjects asked to prioritize future development efforts. All functionality not discussed in each interview.

4.6   Technical Gaps

The numerous technical gaps with TIER are a serious concern. Some may be addressed by infrastructure changes while others will depend on Sequest's continued investment in the TIER product. Technical gaps are summarized below.

1. Architecture is single server, no load balancing or redundancy is available.
2. Development/Backup server in place but unclear if disaster recovery drills have been performed
3. Code maintainability issues ongoing
    a. Heavily reliant on custom (IMSD developed) code for some functions
    b. Major upgrade of TIER available – concerns about custom code could lead to skipping upgrades or issues with upgrades.
    c. Complete list of regression tests not available
4. Major technical issue is performance at HOC
    a. Installation of new T1 or fiber optic would help
    b. Upgrades are necessary regardless of future of TIER EMR
    c. Unclear why delays in improving connectivity have persisted, other than budget constraints
    d. System reliability and usability issues reported as worse at HOC as a result of performance (e.g. commands timing out, users kicked off screens)
5. Database practices non-standard, e.g. database not normalized, design not entirely relational
    a. Implementation of fixes often cause other things to break

4.7   Business Justification Gaps

Most goals spelled out in the justification for the EMR have been partially accomplished, notably the standardization of documentation and tracking of patient care. Benefits of staff efficiency are difficult to document when an EMR is implemented and frequently the ease of accessing centralized information are cited as the main source of improved efficiency. It is common for an EMR to require more time from providers and nursing staff, especially at first, due to the structured documentation. For this reason, user complaint that an EMR decreases efficiency has some basis. Communication of the shared vision that the EMR improves the quality of patient care can aid in the acceptance of the additional work required to learn and use the system.

One goal universally cited as a reason to implement an EMR is improved quality of patient care. Although this goal is implicit in the stated goals of improving documentation, scheduling, tracking, and reporting of inmate care, the statement of quality of care as a specific goal is a noticeable omission in the business justification. Another gap related to the business justification is the failure to communicate the vision and benefits of the EMR well in advance of the implementation. A comprehensive communications effort, focusing on instilling the vision to all staff, is critical to facilitate the organizational change required with an implementation of this magnitude. Sequest, in fact, lists organizational communication as a specific task in their project plan for the implementation. It is apparent from conversations with MCSO staff present before the implementation that this communication did not occur or was inadequate.

5. Recommendations

We considered two main alternative approaches that the County could consider to remedy the gaps identified with TIER. The first approach is to continue operating with the system *as is* and begin the selection process for an alternative EMR. Alternatively, MCSO could complete the TIER implementation to use its full capability. Although we recognize that cost of implementing the two alterative approaches is relevant to the County's determination of the next steps, the scope of this assessment did not allow for the detailed analysis necessary to estimate the financial impact of the two recommendations. Based on our experience and findings, we believe the first approach will offer greater assurance of meeting the County's needs. Consequently, we recommend the first approach.

Optimizing the existing TIER system would require a number of steps and likely involve substantial additional investment. We feel that the vendor's position in the market, the features not supported by TIER, and the ongoing need for MCSO to create custom code to complement or replace TIER functionality are sufficient reason to abandon TIER as a long term solution to the County's EMR needs. In the years since TIER was selected in 2003, more options for EMRs have become available and more vendors have gained experience in a correctional setting. In addition, several major EMR vendors offer remote-hosted EMR software, allowing organizations to reduce their infrastructure investment in an EMR.

We recommend the County select another EMR to replace TIER by undertaking the following actions:

1. Create a structured team that focuses on driving organizational value of the EMR to review the findings of this assessment and confirm the proposed EMR replacement strategy.
    a. Charter this team to work toward goals set by management and/or quality improvement initiatives.

2. Create a master project plan to determine general timeline and budget to implement the EMR replacement strategy.
    a. Detail out milestones to mark high level progress of Phase II project. All milestones should be mapped back directly to the overall business need.
    b. Detail out tasks needed to accomplish milestones.
    c. Detail out resources and/or resource types needed to accomplish the tasks in the project plan.
    d. Document any gaps in resource needs or technology needs preventing team from accomplishing the tasks.
    e. Clearly detail out the resources and responsibilities of those resources in relation to the project plan.
    f. Show the relationship between the tasks for TIER maintenance and the newly selected system.
    g. Define data integrity testing and other testing tasks associated with TIER maintenance in preparation for the data migration to the new system.
    h. Define relationships between tasks and any other dependent projects and demonstrate those relationships and impacts within the project plan
    i. Define training and knowledge transfer activities.

3. Limit continued investment in TIER to those items required to maintain the current functionality or address immediate patient safety concerns.
    a. Conduct directed testing to determine the risk of record mismatches remaining when data entry errors occur. Determine feasibility of performing basic validation on record rollup.
    b. Determine what additional data validation may be implemented in TIER to futher patient safety.

4. Address performance issues at HOC in alignment with long term strategy.
    a. Pilot Terminal Services solution to see if improvement occurs.
    b. Upgrade network connectivity to HOC, if required, to accommodate long term information technology needs.

5. Implement process and role changes for TIER usage and support in alignment with long term strategy.
    a. Formalize training for all disciplines.
    b. Redefine and publicize roles and responsibilities on the execution and maintenance of the system. Publicize role and activity of the TIER Committee to encourage buy-in to process.
    c. Add two nursing line staff (HOC and Jail) and one nurse practitioner (HOC) to TIER Committee.
    d. Standardize and document policies and procedures concerning TIER usage. Work on clinical process standardization to aid in acceptance and system design.
    e. Standardize issue tracking and management.
    f. Improve regression testing process to prevent new issues from reaching production.
    g. Ensure that custom code is well documented in terms of functionality, architecture, and source code comments.